

RELIABILITY OF UPRIGHT AND SUPINE POWER MEASUREMENTS USING AN INERTIAL-LOAD CYCLE ERGOMETER

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Practical, reliable, and time efficient methods of measuring muscular power are desirable for both research and applied testing situations. The inertial-load cycling method (ILC; Power/Cycle, Austin, TX) requires subjects to pedal as fast as possible against the inertial load of a flywheel for only 3-5 seconds, which could help reduce the time and effort required for maximal power testing. **PURPOSE:** 1) To test the intramachine reliability of ILC over 3 separate sessions, 2) to compare postural stance (upright vs. supine) during testing, and 3) to compare the maximal power (Pmax) output measured using ILC to that obtained from traditional isokinetic and leg press testing. **METHODS:** Subjects (n = 12) were tested on 4 non-consecutive days. The following tests were done on the first day of testing: isometric knee extension, isokinetic knee extension at several speeds, isokinetic power/endurance at 180°/sec (Biodex System 4), leg press maximal isometric force, and leg press power/endurance. The other 3 days consisted exclusively of ILC testing. Subjects performed 6 ILC tests in an upright position and 6 ILC tests in a supine position on each day. The starting position was counterbalanced. Mixed-effects linear modeling was used to determine if any differences existed between testing days and between upright and supine for Pmax and revolutions per minute at Pmax (RPM_{pk}). Mixed-modeling was also used to calculate intraclass correlation coefficients (ICC) to determine the reliability of the ILC on each testing day for Pmax and RPM_{pk} (ICCs were calculated separately for upright and supine). “Kendall’s Tau a” was used to determine the association between ILC Pmax and isokinetic and leg press data. **RESULTS:** For Pmax, significant differences were found between days 1 and 2 (upright: p = 0.018; supine: p = 0.014) and between days 1 and 3 (upright: p = 0.001; supine: p = 0.002), but not between days 2 and 3 (upright: p = 0.422; supine: p = 0.501). Pmax ICC values were ≥ 0.97 for all days in both positions. Also, no significant differences between upright and supine postures were found for Pmax. No significant differences between days were found for RPM_{pk}; however, there was a significant posture effect (upright > supine). Moderate correlations were observed between ILC Pmax and isokinetic and leg press tests (upright: 0.64-0.79, supine: 0.52-0.82). **CONCLUSIONS:** Overall, ILC is a very reliable test. Since a significant difference was found between day 1 and the other ILC testing days, it is suggested that day 1 of ILC testing should be used as a familiarization session to allow for subject learning. No significant difference in Pmax was seen from test 3 to test 6. However, an increase of 1.3% was observed from test 4 to test 6. Therefore, although 4 tests may be sufficient for most subjects to produce Pmax, in some cases 6 tests may be required. **PRACTICAL APPLICATIONS:** No differences were seen in Pmax between upright and supine positions despite differing RPM_{pk}. This suggests that ILC testing can be used to provide reliable testing both in an upright position (appropriate for athletes) and in research (e.g., bed rest) or rehabilitation settings where supine testing is necessary. Future research should evaluate whether peak power measurements obtained with the ILC are sensitive to changes such as that observed with training and de-training.